

CONVERGENCE RATES FOR INVERSE PROBLEMS WITH IMPULSIVE NOISE

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Resumo/Abstract:

We study inverse problems $F(f) = g^{\text{obs}}$ where the data g^{obs} is corrupted by so-called impulsive noise ξ which is concentrated on a small part of the observation domain. Such noise occurs for example in digital image acquisition. To reconstruct f from noisy measurements we use Tikhonov regularization where it is well-known from numerical studies that \mathbf{L}^1 -data fitting yields much better reconstructions than classical \mathbf{L}^2 -data fitting. Nevertheless, so far rates of convergence are known only if $\|\xi\|_{\mathbf{L}^1} \rightarrow 0$, which does not fully explain the remarkable quality of the reconstructions obtained by \mathbf{L}^1 -data fitting.

We introduce a continuous model for impulsive noise depending on an impulsiveness parameter $\eta > 0$ and prove convergence rates as $\eta \rightarrow 0$. We therefore use a recently developed variational formulation of the noise level and derive expressions for it in terms of η . It turns out that the rates of convergence (compared to the state of the art) clearly improve depending also on the smoothing properties of the forward operator F .

Finally we present numerical results, which suggest that our results are order optimal or at least close to order optimal.

This is a joint work with Thorsten Hohage.